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December 27, 2002

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Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W., TW-A325
Washington, D.C. 20554

Re: **EX PARTE**
Dotcast, Inc.[1]

Dear Ms. Dortch:

Submitted herewith on behalf of Dotcast, Inc. ("Dotcast") are the following reports prepared by the Advanced Television Technology Center ("ATTC") setting forth the results of laboratory tests conducted by the ATTC to evaluate the impact of Dotcast's dNTSC system on adjacent and co-channel NTSC and DTV television stations: (1) dNTSC DATA BROADCASTING, *dNTSC Compatibility with Adjacent and Co-Channel DTV and NTSC Stations*, Test Plan and Procedures (Doc. No. 02-30, Dec. 2002); (2) dNTSC DATA BROADCASTING, *dNTSC Compatibility with Adjacent and Co-Channel DTV Stations*, Summary of Test Results (Doc. No. 02-31, Dec. 2002) ("Report No. 3"); and (3) dNTSC DATA BROADCASTING, *dNTSC Compatibility with Adjacent and Co-Channel NTSC Stations*, Summary of Test Results (Doc. No. 02-32, Dec. 2002) ("Report No. 3"). On June 28, 2002, the Commission approved the use of Dotcast's dNTSC system by broadcast stations conditioned on the submission of the foregoing reports within six months.[2] This submission thus satisfies the condition imposed on the Commission's authorization of the commercial deployment of the dNTSC system.

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[1] This proceeding is subject to the Commission's "permit-but-disclose" procedures. *See* Public Notice, Application of Dotcast, Inc. for Approval of System for Insertion of Non-Video Data Pursuant to Section 73.682 — "Permit But Disclose" *Ex Parte* Status Accorded, 17 FCC Rcd 6109 (2002).

[2] *See* Letter to Douglas B. Evans, General Counsel, Dotcast, Inc., *et al.*, from W. Kenneth Ferree, Chief, Media Bureau, at 10 (dated June 28, 2002).

As explained more fully in the reports, there were no significant differences in the desired/undesired ratios when dNTSC was added to co-channel and first upper and lower adjacent channel NTSC signals. In the few cases in which *any* differences were tound. the participants actually rated the clips as *better* when dNTSC was added. *See* Repon No. 3 at 13. With respect to co-channel and first upper and lower adjacent channel DTV signals. Report No. 2 explains that each of six different DTV receivers was tested seven times in 18 different reception conditions. These tests were initially performed at a -24dB dNTSC visual injection level, which is 2dB higher than Dotcast's operating injection level of -26dB. Even at this higher injection level, it was noted that in most cases. there was no significant difference between "dNTSC off' and dNTSC on." *See* Report No. 2 at 8-9, n.3.[3] One receiver exhibited *improved* adjacent channel performance in moderate and weak DTV signal conditions at the higher injection level.

Of the 18 test conditions at -24 dB, only five cases exhibited a measurable response to the addition of dNTSC (other than the cases of improved performance noted above).[4] After re-testing at the -26dB injection level, four of the five cases were within 0.50dB of the "dNTSC off' condition, taking into account the 1dB margin of error noted above, while a single receiver (Receiver E) exhibited a greater than 2dB difference in the first adjacent upper channel in a weak DTV signal condition. It should be noted that this particular receiver showed far greater variation in its performance in the "dNTSC off' condition than any other receiver tested,[5] which suggests the presence of an anomaly in the receiver that may have skewed the test results.

Based on the totality of the tests described above and taking into account ATTC's margin of error, Dotcast has concluded that, at the injection level employed in the current system design, the addition of dNTSC will not cause any additional interference to adjacent or co-channel NTSC or DTV stations.

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[3] As ATTC notes in Report No. 2, the statistical nature of digital communications systems and the behavior of certain DTV receivers results in some measurement variation from trial to trial. The measurement resolution is therefore limited by the test methodology. and variations within 1dB should be considered "measurement noise." *Id.* at 9.

[4] *See* Report No. 2 at 9. n.3.

[5] *See id*. Tables 4.5. 4.7. 4.12 (approximately 3.5dB variation even within the seven "dNTSC off" trials). and 4.15.

Two copies of this letter have been submitted to the Secretary of the Commission for inclusion in the public record, as required by Section 1.1206(b)(2) of the Commission's rules.

Very truly yours,

Margaret L. Tobey

Margaret L. Tobey

cc Keith Larson (by e-mail)
Robert Bromery (by e-mail)
Qualex International (by e-mail)

dNTSC Data Broadcasting

dNTSC Compatibility with Adjacent and Co-Channel DTV and NTSC Stations

Test Plan and Procedures

Document No. 02-30

December 2002

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Table of Contents

1 Introduction

1.1 Background

Dotcast. Inc. has developed a unique system that allows television broadcasters to transmit up to 5.7Mbps of data within their existing analog NTSC service. The Dotcast system of adding a data subcarrier to NTSC is known as dNTSC™. Since the data is carried within the current NTSC TV channel allocations. there is a need to quantify any impact that the dNTSC system may have on existing services in the broadcast TV band. This type of testing has been commonly referred to as *compatibility* testing.

ATTC has been contracted by Dotcast to perform independent, third party laboratory tests on the dNTSC system. Prior tests, conducted in Oct. 2001 and Feb. 2002, were designed to evaluate whether dNTSC significantly impacts the video and audio quality of a *host* NTSC station (i.e. if a broadcaster implements dNTSC, would this impact the picture or sound quality of his own station?)

Currently. there is a need to perform additional compatibility tests to determine whether dNTSC affects *other* TV stations in the broadcast hand (i.e. if a broadcaster implements dNTSC. would this affect the picture or sound quality of *other* TV stations?). In this case, the "other" stations will **be** transmitting either DTV or analog NTSC.

1.2 Document Scope

This document describes a comprehensive test plan developed to evaluate whether the dNTSC system will impact other television stations in the broadcast band. A complete description of the test program is provided, including objectives, methodologies, test conditions. hardware setups and procedures. As the test program progresses, this document will he continually updated to reflect necessary changes and to maintain an accurate record of the test procedures that were followed.

1.3 Related Documents

All test *results* are documented separately, and may be found in the following ATTC document(s):

ATTC Doc. #02-31, dNTSC Data Broadcasting, dNTSC Compatibility with Adjacent and Co-Channel ***DTV*** *Stations, Summary of Tent Results, December 2002*

ATTC Doc. #02-32, dNTSC Data Broadcasting, dNTSC Compafibility with Adjacent and Co-Channel NTSC ***Stations,*** *Summary of Test Results, December 2002*

Readers of this test plan may also be interested in previous elements of the dNTSC test program. For further information, please refer to the following documents:

ATTC Doc. #02-05, dNTSC Data Broadcasting Subjective Aural Compatibility Tests of the Dotcast dNTSC System, Test Plan and Procedures, February 2002

ATTC Doc. #02-06, dNTSC Data Broadcasting, Subjective Aural Compatibility Tests of the Dotcast dNTSC System, Summary of Test Results, February 2002

ATTC Doc. #01-17, dNTSC Data Broadcasting, Tier I – Test Plan, October 19, 2001

ATTC Doc. #01-18, dNTSC Data Broadcasting, Host NTSC Channel Compatibility of the Dotcast dNTSC System, Summary of Test Results, October 19, 2001

2 Test Program Overview

2.1 Background on Table of Allotments

Since there is only a finite amount of electromagnetic spectrum available for the TV broadcasting service and there has historically been high demand for the spectrum that is available. the United States Federal Communications Commission (FCC) developed a plan whereby TV channels may be "re-used' throughout the United States. This plan is commonly referred to as the *Table of Allotments,* and is detailed in the FCC rules and regulations'. The Table of Allotments specifies which TV channels may be used for television broadcast in cities throughout the U.S..

In actuality, the current broadcast TV allotments are specified in their entirety by *two* separate. but interdependent, allotment tables. The first allotment table describes all *analog TV* (NTSC) station assignments. The FCC substantially completed this table in a 1952 document colloquially referred to as 'The Sixth Report and Order"',:'. More recently, the FCC completed a second allotment table. which specifies all *digital TV* (DTV) channel assignments throughout the U.S.. For the time being, the analog NTSC and digital DTV allotment tables must co-exist, at least until the migration to digital technology is complete. Taken together. these two allotment tables describe which TV channels may be lawfully occupied by a broadcaster in any given U.S. city or metropolitan area.

The careful construction of these two tables on a city-by-city basis has allowed thousands of analog NTSC and DTV stations to co-exist within a finite area of the electromagnetic spectrum. This is made possible due to the limited propagation distance of TV signals in the Very High Frequency (VHF) and Ultra High Frequency (UHF) bands. By structuring the allotment tables such that TV transmitters are separated from one another by well-defined geographical distances, it has been possible to prevent stations from significantly interfering with one another. This has enabled the concept of frequency re-use in the broadcast TV hands, and is the basis for the FCC's Table of Allotments.

As an example of frequency re-use in the Table of Allotments, consider the fact that both Washington. D.C. and **New York** City have TV stations that occupy Channel **4** in the broadcast band. This arrangement is possible due to the geographic separation between the two cities and the limited propagation distance of TV signals. If these stations were located closer together (e.g. Washington, D.C. and Baltimore, MD), the two stations would interfere with one another, and many viewers would experience difficulty in receiving a high quality signal from either station. This type of interference is classified as *co-channel* interference.

In addition to co-channel interference, there are various other interference mechanisms that may occur between two TV stations. Each of these mechanisms can potentially limit the ability of a TV set to properly receive and present high quality video and audio to the

[1] U.S Code of Federal Regulations, 2000, Vol. 47, Parts 70 to **79.** sec. 73.606 and **73.622**
[2] *Sixth Report and Order,* U.S. Federal Register. May 2, **1952,** Vol. 17, **pg.** 3905
'Although **the** table of allotments was substantially completed in **1952**, numerous modifications **haw been** made to the Table in the subsequent decades.

consumer. Table 2-1 enumerates the well-known interference mechanisms that may arise between two TV stations'.

The FCC was aware of these issues when it developed the Table of Allotments, as it sought to mitigate these problems bv specifying minimum distance separations between TV transmitters, However. these interference scenarios do still occur in the "real world' for a variety of reasons, and must be considered when planning changes to the broadcast systems or the FCC Table of Allotments.

Table 2-1 Potential TV Station **to** TV Station Interference Mechanisms

Name	Description	Applies to..
Co-Channel	An undesired station that occupies the *same* channel as the desired station causes interference (e.g. Ch.4 in Washington D.C. interferes w/ Ch. 4 in NYC)	VHF & UHF Bands
Adjacent Channel (a.k.a. N +/- 1)	**An** undesired station that is either 1 channel above or below the desired station causes interference (e.g. Ch. 12 in Philadelphia interferes w/ Ch. 13 in Baltimore)	VHF & UHF Bands
N +/- 2 Taboo Channel	An undesired station that is either 2 channels above or below the desired station causes interference.	UHF Band Only
N +/- 3 Taboo Channel	An undesired station that is either 3 channels above or below the desired station causes interference.	UHF Band Only
N +/- 4 Taboo Channel	An undesired station that is either 4 channels above or below the desired station causes interference.	UHF Band Only
N +/- 5 Taboo Channel	An undesired station that is either 5 channels above or below the desired station causes interference.	UHF Band Only
N +/- 7 Taboo Channel'	An undesired station that is either 7 channels above or below the desired station causes interference.	UHF Band Only
N +/- 8 Taboo Channel	An undesired station that is either 8 channels above or below the desired station causes interference.	UHF Band Only
N + 14 Taboo Channel	An undesired station that is 14 channels *above* the desired station causes interference	UHF Band Only
N + 15 Taboo Channel	***An*** undesired station that is **15** channels *above* the desired station causes interference	UHF Band Only

[4] Note that there are *many* other RF channel conditions that affect the quality of TV reception, including multipath. AWGN type noise, impulsive noise, "land mobile" transmitters, amateur radio transmitters. etc... However. the focus of this particular test program is exclusively on quality drgradntion caused by TV station to TV station interference.

NTSC into NTSC Co-Channel Interference

The FCC. in its 1952 Sixth Report and Order. sought to reduce or eliminate co-channel interference between NTSC TV stations by specifying a *minimum* distance separation between two transmitters that share the same TV channel (see Table 2-2). In most cases, this distance separation has proven adequate. and viewers may tune to their local stations without experiencing co-channel interference from stations located in distant cities.

Table **2-2 Minimum** Co-Channel NTSC to NTSC Distance Separations*

Zone**	Channels 2-13	Channels 14-69
I	170 miles	155 miles
II	190 miles	175 miles
III	220 miles	205 miles

*Taken from October 1, 2000 edition of the Code of Federal Regulations – sec. 73.610
**For the purposes of TV channel allocations, the FCC has divided the United States into three distinct geographic "zones".

In the FCC's Sixth Report and Order, it was decided that no protection would be provided against co-channel interference that is a result of unusual and temporary reception conditions (i.e., "skywave" reception conditions).[5] However. it was noted that the co-channel interference situation could be vastly improved if a system of *frequency offsets* was adopted.

Due to the nature of the analog television signal, "gaps" exist in the frequency spectrum of NTSC TV signals. In co-channel interference scenarios, two stations may be slightly offset from one another in frequency. This frequency offset causes the signal spectra of the two stations to interleave, thereby reducing the interference they cause to one another. This scenario may also be extended to situations with three stations that occupy the same channel. The first station may have **zero** frequency offset, the second station may have a slight positive frequency offset, and the third station may have a slight negative frequency offset. In this arrangement, co-channel interference is greatly reduced compared to the case with no frequency offsets. Since there is minimal economic and technical downside to the implementation of this system, frequency offsets were used throughout the FCC's Table of Allocations in an effort to combat co-channel interference.

NTSC into NTSC First Adiacent Channel Interference (N+/-1)

As was the case for the co-channel interference previously described, the FCC's 1952 Sixth Report and Order also sought to minimize station-to-station interference due to *adjacent* channel allotments. The FCC specified minimum distance separations between TV transmitters broadcasting signals on adjacent frequencies (see Table 2-3). It is important to note that frequency offsets are *not* employed to minimize adjacent channel interference, in contrast to the case of co-channel interference. Also, unlike co-channel interference. the

[5] *Sixth Report and* ***Order.*** U.S Federal Register. May 2, 1952. Vol. 17, pg. 3914

FCC did *riot* divide the country into three geographic zones when establishing minimum distance separations between adjacent channels.

	Channels 2-13 (VHF)	Channels 14-69 (UHF)
Upper Adjacent	60 miles	55 miles
Lower Adjacent	60 miles	55 miles

2.2 Objectives

The preceding section discussed the FCC table of allotments and potential station-to-station interference mechanisms. However, the focus of this particular test program is on evaluating the impact of dNTSC. Specifically, the primary objective is to determine if the addition of dNTSC to the broadcast spectrum significantly affects the station-to-station interference scenarios described above. This class of tests is commonly referred to as *compatibility testing.*

[6] DTV signals are "less severe" interferers than standard NTSC signals for several reasons: 1) DTV signals typically operate at lower power levels 2) DTV has no high power "carrier" signal, which allows DTV stations to operate on channels adjacent to existing NTSC signals 3) DTV signals are "noise-like", such that when interference does occur, it is subjectively less annoying than an NTSC interferer.

2.3 Test Conditions

As discussed in section 2.1 and Table 2-1. there are approximately ten different types of well-known station-to-station interference mechanisms. However, in reality, there are tens of thousands of different conditions that may he encountered when additional variable are considered. Some of these variables might include: RF signal strengths, frequency offsets. audio/video program content, modulation tvpes (NTSC vs. 8VSB), audio subcarrier configurations. aural to visual power ratios. varying receiver designs, etc... Consequently. these conditions must be somewhat constrained in order to create a practical test program and focus on the conditions of primary interest. This particular test series will focus on the test conditions shown in Table 2-4.

Table 2-4 Summary **of Interference Scenarios Included** in **Test Program**

Desired Signal Tvpe	Undesired Signal Type	Desired to Undesired Channel Relationship
NTSC	NTSC/dNTSC	Co-Channel
NTSC	NTSC/dNTSC	Upper Adjacent
NTSC	NTSC/dNTSC	Lower Adjacent
DTV	NTSC/dNTSC	Co-Channel
DTV	NTSC/dNTSC	Upper Adjacent
DTV	NTSC/dNTSC	Lower Adjacent

2.4 Receivers Under Test

Eight consumer grade NTSC television receivers will be included in the portions of the test program where the desired signal is analog NTSC. In cases where the desired signal is 8VSB DTV, six consumer set-top-boxes/receivers will he included.

Five of the analog NTSC receivers have been chosen from the sample originally used by ATTC in the Grand Alliance tests (1990 vintage receivers). The remaining three NTSC receivers were purchased more recently (Sept. 2001) at a local consumer electronics retailer. 4s a practical constraint, only NTSC receivers with baseband audio and video output connectors are included in the sample. These outputs are necessary to generate the recordings required for rigorous subjective evaluation.

The six DTV receivers included in the sample were purchased by ATTC from the immediately available stock of several consumer electronics retailers in May 2002. Only receivers that could be obtained through normal consumer electronics channels were included (i.e. - all of the receivers under test could he purchased by any consumer as of May 2002)

Table 2-5 enumerates the make and model of each analog NTSC and DTV receiver.

*Note that the order of this table does **not** imply which make & model correspond to receiver designations "A" through "F" or "1" through "8" (i.e. Row 1 is not necessarily Receiver "1" and Row 9 is not necessarily Receiver "A").*

Table **2-5 Consumer** Receivers Under Test

Type	Make	Model	Serial #	Source	Mfg Date
Analog NTSC Receivers					
20" NTSC/Stereo	JVC	AV2080S	14518643	Grand Alliance	Sept 1990
27" NTSC/Stereo	Toshiba	27A51	1981082907	Best Buy (local retailer)	Aug 2001
27" NTSC/Stereo	Sony	KV27XBR10	7045078	Grand Alliance	March 1990
27" NTSC/Stereo	Samsung	TXK2766	39ZR566151L	Best Buy (local retailer)	May 2001
27" NTSC/Stereo	Mitsubishi	CS2723R	003346	Grand Alliance	July 1990
27" NTSC/Stereo	Magnavox	RS5660	78273259	Grand Alliance	1990
27" NTSC/Stereo	Philips	27PS60 S121	60755781	Best Buy (local retailer)	Aug 2001
20" NTSC/Stereo	Samsung	TC2065S	0604000590	Grand Alliance	June 1990
DTV Receivers					
DTV/Satellite set-top-box	RCA	DTC-100	112619241	RCA (website)	
DTV/Satellite set-top-box	Echostar	6000T	RAECHM036 34C	Dish Depot (website)	
DTV set-top-box	Samsung	SIR-T150	31HT300272J	Best Buy (website)	March 2002
DTV/Satellite set-top-box	Toshiba	DST-3000	T33A48196A1 B	Best Buy (local retailer)	
DTV/Satellite set-top-box	Zenith	DTV1080	1A1-12450218	Belmont TV (local retailer)	Nov 2001
DTV Display w/ Integrated Tuner	Sony	KD-34XBR2	8006057	Myer-Emco (local retailer)	Nov 2001

2.5 Test Methodologies

In order to quantify dNTSC's impact (if any) on station-to-station interference, a series of controlled laboratory tests will be conducted. Each test will simulate a specific interference condition (e.g. co-channel/lower 1st/upper 1st), and quantify the interference severity for this condition. The dNTSC data subcarriers will then be added to the *interfering* station, and the interference severity will be quantified once again. The test cases in which dNTSC was turned *off* may then be compared with the cases in which dNTSC was turned *on*. The *primary test variable*, therefore, is the presence or absence of a dNTSC signal in each television reception condition. In this manner, the effect of adding dNTSC data subcarriers to an interfering station may be evaluated.

This generalized methodology description applies to all tests designed to evaluate dNTSC compatibility with both NTSC and DTV. However. the implementation of this methodology differs significantly. depending on whether the desired signal is DTV or analog NTSC.

2.5.1 DTV Test Methodologies

In cases where the "desired signal is DTV, there are generally two classes of methodologies which may be used to evaluate the reception performance of DTV receivers. These evaluation methodologies may be defined as: 1) Objective evaluation 2) Subjective evaluation.

Objective DTV evaluation methods typically employ Bit-Error-Rate (BER) measurements to precisely count the number of bit errors that occur within a given time interval. This technique requires test instrumentation that keeps a running tally of bit patterns received. Other variations on this method. including symbol error rate, may also be used.

Subjective evaluation methods. on the other hand. are comprised of test methodologies that use the human auditory and visual systems as the primary measuring "instrument". These methods may incorporate viewing tests, listening tests or some other procedure in order to evaluate the "overall quality" as perceived by a human viewer or listener.

Since the consumer DTV receivers under test can not be readily interfaced with conventional BER test equipment, subjective evaluation methods will be employed exclusively. However, the subjective evaluation procedures used with DTV are quite different than traditional subjective measurements. due to DTV's well-known "cliff effect" failure mode. The cliff effect makes it easy for trained human subjects to unequivocally identify the point of DTV degradation/failure. Consequently, subjective DTV tests exhibit good repeatability between test subjects (viewers).

Nonetheless, in order to achieve consistent and repeatable test results, the subjective test procedure must be precisely defined. More DTV test procedure details may be found in section 6.1.

2.5.2 NTSC Test Methodologies

In contrast to DTV transmission test methods, NTSC transmission test methodologies depend heavily on sophisticated subjective test techniques. In cases where the desired signal is analog NTSC, this test program will follow a multi-step subjective evaluation process, utilizing expert/trained subjects, panels of expert/trained subjects and consumer subjects as appropriate. Figure 2-1 provides an overview of this multi-step subjective evaluation process.

As the figure illustrates, the subjective evaluation process starts with an initial "ranging" step to bound the D/U ratios under test, and ultimately culminates in the presentation of numerous audio/video clips to a large group of non-expert consumers. Consumers are asked to rate clips. one-by-one, on a 6-point MOS scale, from Excellent (5.0) to Failure (0.0).Table 2-6 illustrates the type of data that will result from these subjective tests. By comparing the dNTSC-Off vs. dNTSC-On columns, the reader will be able to determine if and how much dNTSC significantly changes consumers' opinions of the transmission quality.

Additional details about the entire subjective evaluation process are provided in section 3

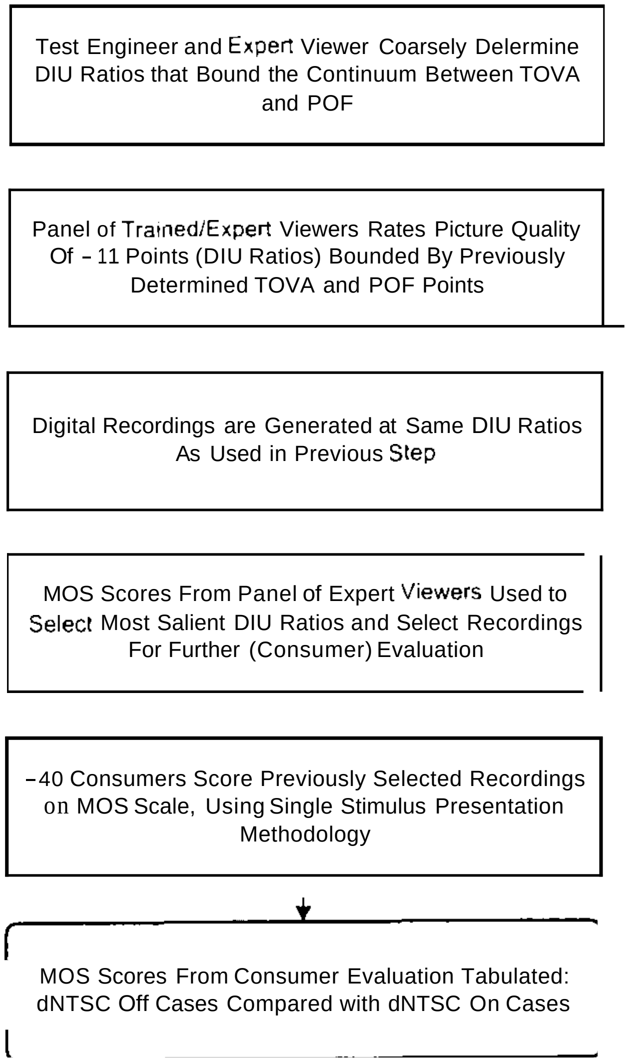

Figure 2-1 NTSC Test Methodology Flow Diagram

Table 2-6 Hypothetical Test Results from Subjective Tests

Interference Type	D/U Ratio (dB)	Quality Rating (on a 6 point MOS Scale)	
		dNTSC Off	dNTSC On
Co-Channel	TOVA-2dB	1.8	4.8
	TOVA	4.7	4.6
	TOVA+2dB	3.9	3.8
	TOVA+4dB	3.1	3.2
	TOVA+6dB	2.5	2.5

3 Description of Test Setup

3.1 dNTSC System Under Test

The Dotcast dNTSC system shall be configured to operate on both the aural and visual carriers of the undesired (interfering) NTSC station. In general. the hardware and software of the dNTSC system will be the same as used in previous elements of the test program, including prior "host compatibility" tests. *However,* one substantial change has been be made to the dNTSC visual data system. The signal spectrum of the dNTSC visual data has been shifted approximately 62.8kHz from its previous location, such that the outer edge of the dNTSC signal is 62.8kHz farther away from the lower channel edge than in the previous host compatibility tests.

3.2 Test System

3.2.1 Main Test Platform

The interference conditions will be simulated using a specially constructed laboratory test platform. This platform will consist of a variety of audio, video and RF test equipment, configured to simulate two TV broadcast stations - one "desired" TV station and one "undesired" TV station.[7] Each station may be configured to occupy any one of a number of different channels in the VHF/UHF bands, such that various frequency separations may be established between the two stations. The desired station may also be configured to broadcast either an NTSC analog or 8-VSB DTV signal. The power levels and frequency offsets of these channels may be varied in fine increments.

The RF signal spectrum created by the test bed will be coupled into a selection of consumer TV receivers (both analog and DTV), and the performance of these receivers will be evaluated in the various interference conditions created by the test platform. In cases where NTSC is the desired signal, the video and audio outputs of the NTSC receivers will be recorded to digital video tape, for subsequent use in an extensive subjective quality evaluation program.

Figure 3-1 illustrates a top level view of the DTV test platform. Figure 3-2 illustrates a top level view of the NTSC test platform.

[7] By convention. the "desired signal is the local TV station that a viewer is attempting to receive. The "undesired'signal is another (possibly distant) TV station that is interfering with the desired signal. and possibly degrading the audio or video quality on the viewer's TV set. This convention will be maintained throughout this document.

Figure 3-4 is a screenshot of the Graphical User Interface (GUI) for the subjective test platform. Once test participants have viewed an entire audio/video clip. the NTSC display switches over to the computer output. and presents the user with the prompt shown in Figure 3-4.

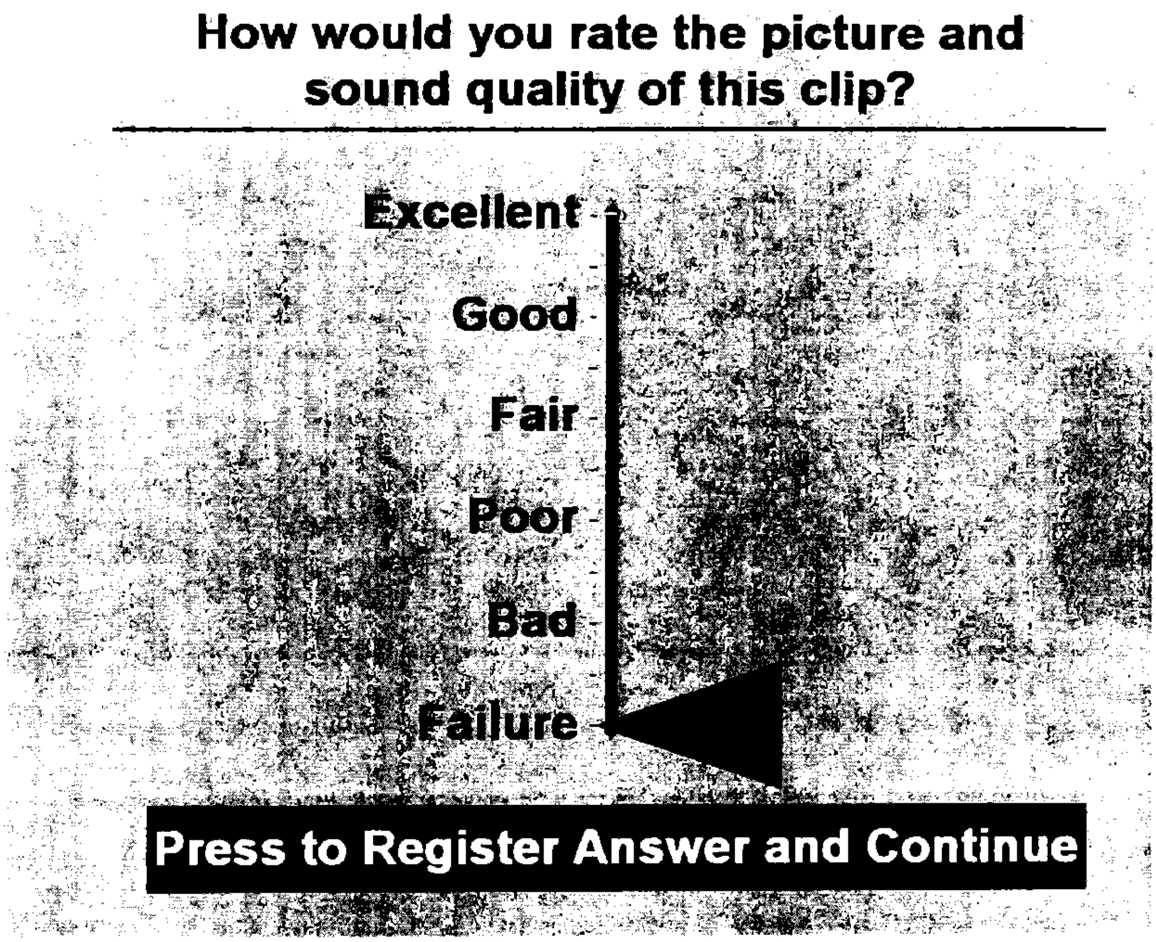

Figure 3-4 Screenshot of Subjective Test User Interface